Earth's natural quasicrystals came from outer space. Last year's Nobel Prize in Chemistry honored Dan Shechtman for his 1982 synthesis of quasicrystals, materials lacking translational symmetry but displaying rotational symmetries not possible in crystals (see PHYSICS TODAY, December 2011, page 17). Nature, however, had long before pulled off that trick; in 2009 theorist Paul Steinhardt, mineralogist Luca Bindi, and colleagues announced that a museum in Florence, Italy, housed a mineral that included a quasicrystal, since named icosahedrite, alleged to have been found in Russia's Koryak Mountains (see PHYSICS TODAY, August 2009, page 14). Various researchers speculated on the source of the quasicrystal, but a team led by Steinhardt solved the mystery: Icosahedrite was brought to Earth by a 4.5-billion-year-old carbonaceous chondrite meteorite. The key clue was that the icosahedrite was surrounded by a second mineral, stishovite, which forms only at high temperature and extreme pressure. To distinguish between the plausible possibilities of formation deep within Earth and formation in a meteorite collision, the researchers studied the icosahedrite-containing mineral's oxygen-17 and oxygen-18 content; the relative abundances of the two isotopes are different for materials of terrestrial and extraterrestrial origin. Subsequent to that analysis, Steinhardt organized an expedition to the Koryak Mountains, where the group found other icosahedrite-containing minerals (see the figure) whose study confirmed the extraterrestrial origin of the natural quasicrystal. From a condensed-matter perspective, say the authors, the analyses (and other evidence not yet published) suggest that quasicrystals are not necessarily delicate metastable oddities; rather, like crystals, they can be energetically stable. (P. J. Steinhardt, L. Bindi, *Rep. Prog. Phys.* **75**, 092601, 2012; L. Bindi et al., *Proc. Natl. Acad. Sci.* **109**, 1346, 2012.) —SKB

Less trade, quieter seas. At frequencies between 10 and 100 Hz, the predominant sources of undersea sound are ships, whales, and earthquakes. To discover how much the total level depends on the number of ships, Megan McKenna of the Scripps Institution of Oceanography in San Diego, California, and her colleagues exploited two impromptu modulations in maritime traffic. The first was the Great Recession, which beset the US from December 2007 through June 2009. During that period, shipments into and out of the Port of Long Beach, the US's second busiest, fell by 15%. The second modulation was regulatory. In July 2009 California mandated that ships passing within 24 nautical miles of its coast use low-sulfur fuel. Instead, ships began avoiding the coastal route through the Santa Barbara Channel. Meanwhile, the Scripps Whale Acoustic Lab has been using hydrophones like the one shown here to monitor the channel since 2006. From that stream of data, McKenna and her colleagues harvested sound levels at two frequencies, 40 Hz and 90 Hz, that are close to the peak of the mean ship spectrum, yet outside the whale communication spectrum. Correlating those levels with two measures of maritime trade—the number of ships plying the Santa Barbara Channel and the number of containers arriving at and departing Long Beach—the team found that one fewer ship transit per day reduced noise on average by 1 dB, a significant drop given the volume of traffic. The resultant effect on whales is unclear. (M. F. McKenna et al., *J. Acoust. Soc. Am.* **132**, EL169, 2012.) —CD

Cloud simulations improving in climate models. An improved understanding of Earth's climate requires not only good data but also good computer models to make sense of the data. Currently there are about 20 climate models in use around the world that generate the indicators—including temperature, precipitation, clouds, and water vapor—on which the Intergovernmental Panel on Climate Change bases its projections. The largest uncertainties in the IPCC assessments—the most recent was in 2007—arise from how the models handle the complex feedback mechanisms of clouds and water vapor. Until recently, the "ground-truth" data for the simulations were sparse and provided climate scientists with incomplete knowledge. But that has changed with data from the A-Train constellation of satellites during 2006–09. (For an overview of the A-Train, see the article in PHYSICS TODAY, July 2010, page 36.) In particular, the observations from space unraveled the three-dimensional structure of clouds and water vapor over the entire globe, providing the basis for a deeper understanding of the relevant microphysics, such as the role of ice crystals. Using the new data, a collaboration of 30 scientists from 9 countries has now made a detailed and quantitative evaluation of both new and old models. The analyses reveal that in 12 cases, the new models are measurably improved over the older versions that contributed to the 2007 IPCC assessment. In general, water vapor is better simulated than clouds, and lower-altitude clouds fare better in the models than those very high up. Individual models were graded, but taking the mean of all models produces the best results, presumably because errors arising from different assumptions and treatments of microphysics average out. (J. H. Jiang et al., *J. Geophys. Res.* **117**, D14105, 2012.) —SGB ■